

# NOTES 18: THE NORMAL DISTRIBUTION

Stat 120 | Fall 2025

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Three main topics of Stat120:

1. \_\_\_\_\_: Summarizing data with numbers and graphs
2. \_\_\_\_\_: Using confidence intervals to estimate parameters with uncertainty
3. \_\_\_\_\_: Using p-values to evaluate competing hypotheses

Up until now, we've relied on computer simulations (via StatKey or R) to generate \_\_\_\_\_ or \_\_\_\_\_ distributions.

We're now going to begin using \_\_\_\_\_ to generate these distributions instead

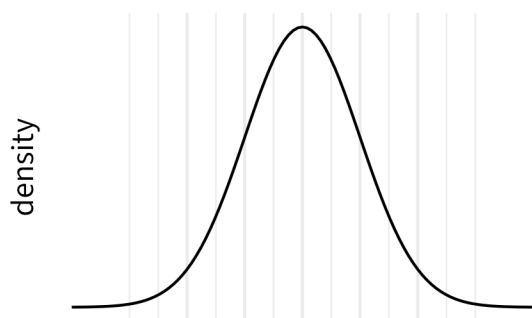
## Normal Density Function:

$$f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{1}{2\sigma^2}(x-\mu)^2}$$

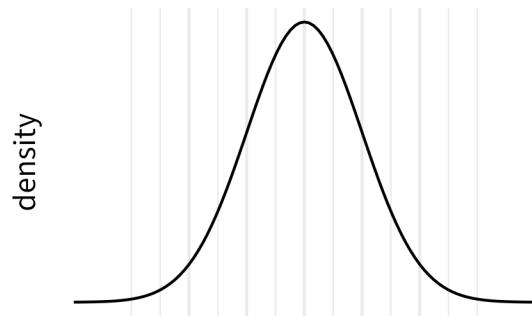
Notation:

Area under the curve =

**Example 1:** Verbal SAT scores follow a normal distribution with a population mean of  $\mu = 580$  and population standard deviation  $\sigma = 70$ . What proportion of test-takers score above 650?



**Example 2:** What is the SAT score for the 90th percentile?



**Z-scores:**

**Standard Normal Model**

**Central Limit Theorem:** For random samples, if \_\_\_\_\_ is big enough, the sampling distribution of \_\_\_\_\_ is approximately \_\_\_\_\_, *regardless of what shape the population distribution is.*

CLT shortcut for testing:

CLT shortcut for confidence intervals:

Summary of R commands (sketch normal curves to help you remember)

```
pnorm(650, mean = 580, sd = 70, lower.tail = FALSE)
```

```
[1] 0.1587
```

```
qnorm(.9, mean = 0, sd = 1, lower.tail = TRUE)
```

```
[1] 1.282
```